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Water Availability for the Western United States: the Scientific Challenges

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Water Availability for the Western United States: The Scientific Challenges

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In the American West, the availability of water has become a serious concern for many communities and rural homeowners. Water of acceptable quality is harder to find because local sources are allocated to prior uses, depleted by overuse, or diminished by drought stress. Some of the inherent characteristics of the West add complexity to the task. The most rapidly growing States in population are in the Southwest—the most arid region on the continent. There is evidence that the climate is warming, which will have consequences for the Western water supplies, such as increasing minimum streamflow and earlier snowmelt events in snow-dominated basins. Endangered species are disproportionately represented in the Western States, and water availability now means sustaining riparian ecosystems and individual endangered species. Periodic inventory and assessment of the amounts and trends of water available in surface water and ground water are needed to support water management. The widespread perception that the amount of water available is diminishing with time needs to be replaced with fact. For the major Western rivers, there is either no long-term streamflow trend or the trend is increasing. In contrast, systematic information is lacking to make broad assessments of ground-water availability, but for specific aquifers where data are available, the aquifers are being depleted.

The complexity added to the issue of Western water availability by these and other factors gives rise to a significant role for science. Science has played a role in support of Western water development from the beginning, and the role has evolved and changed over time along with society's values. The role for science is discussed in three phases—development and construction, consequences and environmental awareness, and sustainability. The development and construction includes some historical accounting of water development for the West and how some precedents set then, still exist today. Science has played an important role in objectively pointing out the consequences of this initial phase such as; converting the Nation's rivers to reservoirs, the effects of ground-water pumping on surface water in streams, land-surface subsidence, and the changes in water quality brought about by the disposal of wastewater and manmade chemicals into the Nation's waterways and aquifers. The sustainability phase is the final goal in the evolution of water development for the West and is a threshold over which science and management has yet to cross. Sustainability, as presently interpreted, goes beyond mere water availability for water supply, and includes ecosystems and even individual species. Sustainability by this definition is superficially appealing but is and will continue to be a significant challenge for science to translate into a measurable water-management strategy. A sustainable water supply for a community would ideally provide enough water to support a growing population and economy, even during protracted periods of drought—a tall order. In order to achieve sustainable use, scientists, managers, policy makers and water users at large will need to develop, communicate, and use scientific information in more effective ways. New collaborative ways of conducting monitoring and research, across disciplinary lines will be

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needed to develop quantitative habitat requirements for ecosystems and endangered species. The new role for science will be to support environmental decision making to achieve some new level of sustainable use that will provide an assured supply of good-quality water for humans and for stream and riparian ecosystems.